
नदी घाटी परियोजनाओं के निर्माण,
प्रचालन और रख-रखाव की
सुरक्षा संहिता

भाग 3 संयंत्र एवं मशीनरी
(पहला पुनरीक्षण)

**Safety Code for Construction,
Operation and Maintenance of
River Valley Projects**

Part 3 Plant and Machinery
(*First Revision*)

ICS 93.160

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FOREWORD

This Indian Standard (Part 3) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Safety in Construction, Operation and Maintenance of River Valley Projects Sectional Committee had been approved by the Water Resources Division Council.

With large scale increase in construction activity of river valley projects, the number of major accidents has increased. The degree of safety achieved in project constructions has a direct bearing on the amount of effort expended to avoid accidents by those who control the conditions and practices on the project.

This standard is published in eleven parts. Other parts of this series is:

(Part 1) : 2013 General aspects (*first revision*)

(Part 2) : 2013 Amenities, protective clothing and equipment (*first revision*)

(Part 4) : 2013 Handling, storage and transportation of explosives (*first revision*)

(Part 5) : 2014 Electrical aspects (*first revision*)

(Part 6) : 1983 Construction

(Part 7) : 1993 Fire safety

(Part 8) : 1995 Open excavation

(Part 9) : 1998 Canals and cross drainage works

(Part 10) : 1983 Storage, handling, detection and safety measures for gases, chemicals and flammable liquids

(Part 11) : 2012 Underground excavation

There are a number of aspects that need to be kept in mind when the safety norms of an entire river valley project are envisaged. To this end, various aspects that need consideration, from the viewpoint of safety, are dealt with in various parts of this standard.

This Part covers the safety aspects to be kept in view during usage of plant and machinery.

Various machinery, plants and other mechanized equipment play a vital role in the construction, operation and maintenance of river valley projects. Safety of the plants and machinery used and installed is an important and essential part of planning as no other segment of the project will pay greater dividends with minimum investment than a good safety programme.

Inadequate safety measures in respect of plant and machinery can result, besides others, in the following mishaps:

- a) Loss of human lives,
- b) Temporary or permanent injury to workers,
- c) Loss or damage to equipment,
- d) Loss of material, and
- e) Loss of valuable time.

The guidelines given in this standard are generalized and indicative in nature, given for the guidance of the concerned project engineers. Each project may have its own safety hazards which need to be identified and taken care of accordingly. Further, in addition to these general guidelines the instructions issued by the suppliers of various equipment should be strictly adhered to.

This standard was first published in 1992; however, the Committee responsible for the formulation of this standard decided to revise it based on the experience gained since then as well as considering technological development in the field. Some of the important clauses which are included in this revision are: job training programme for the operation and maintenance of new equipment (**3.3**), use of out of service tag (**4.3**), work permit (**4.4**), marking on plant or machinery (**4.6**) and risk control measures during use of mobile machinery (**5.1.9**).

Indian Standard

SAFETY CODE FOR CONSTRUCTION, OPERATION AND MAINTENANCE OF RIVER VALLEY PROJECTS

PART 3 PLANT AND MACHINERY

(First Revision)

1 SCOPE

1.1 This standard (Part 3) lays down the safety requirements for plant and machinery used in river valley projects.

2 TRAINING TO NEW/IN-EXPERIENCED PERSONNEL

2.1 An in-experienced worker is the chief casualty in accidents on construction sites. Before recruitment of any personnel, he should be properly screened for the job he is likely to be entrusted. Thorough checking and screening at the time of appointment in regard to his experience, suitability and any disability which might affect his work, is very essential.

2.2 All new personnel should be given training/information about safety aspects for the plant and machinery used at the site.

2.3 It should be the responsibility of the safety officer to make the safety process effective. Each section head may hold a short safety session with his section as often as conditions warrant. The workers should be given ample opportunity to participate in the discussions. Sometimes the most effective method of emphasizing safety practices is by demonstration.

2.4 Any employee who persists in causing accidents should be replaced.

3 TRAINING ON ARRIVAL OF ANY PIECE OF EQUIPMENT

3.1 On arrival of any new equipment both the operation and the repair staff should be trained in its use under the supervision of the erection personnel deputed by the firm. If necessary they may be shown documentaries and films by the erection engineers to understand the working of the equipment properly including the safety aspects.

3.2 The operator should be encouraged to report any abnormal indications/noise promptly to the unit level maintenance staff.

3.3 On job training programme for the operation and maintenance of new equipment should be conducted for the operators and repair staff in presence of

manufacturer's personnel and safety officer of the project.

3.4 A copy of manufacture's manual/guidelines should be available for reference at site.

4 GENERAL

4.1 The main sources of injury to operators and others working around machinery are:

- a) Repairing and servicing equipment in dangerous positions,
- b) Unexpected violent tipping of the machine,
- c) Unexpected violent shocks or jerks to the machine,
- d) Leaving earth moving and other equipment unattended in a dangerous position, and
- e) Not following the safety measures prescribed by the suppliers of the plant or machinery.

4.2 Schedules for preventive maintenance should be made effective for various kinds of machines as per manufacture's guidelines.

4.3 'Out of Service' Tags should be used to identify equipment or machinery that has been taken out of service due to a fault, damage or malfunction. The tag is to be securely fixed to the operating control power with the appropriate details written on the tag (explaining the reason for the machine being 'out of service'). The tag should not be removed until the equipment is safe to be returned for use, or the reason for the tag no longer exists. It may be removed by the person who attached the tag or the supervisor responsible for the operation or repair of the equipment or by the maintenance person who carried out the repairs.

4.4 Work Permit

Before taking up any maintenance work in plant, the maintenance wing should take permit to work from the operation wing before start of work. A maintenance display board should also be placed indicating 'work in progress' both at site and plant operation room. After completion of work, permit should be returned to the operation wing for resumption of the operation.

4.5 All the plants and machineries of the project are to be deployed based on the existing working condition and the nature of hazards at work site.

4.6 Standardized guidelines and marking on plant or machinery should be in place to ensure safety of employees for safe work practices. It should be ensured that all START/STOP and emergency controls are clearly labeled and visible.

5 SOME DO'S AND DONT'S

5.1 Do's

5.1.1 Make all adjustments and repairs with the parking brake set, engine inoperative and hydraulic systems not under pressure.

5.1.2 Make sure all the pressure and temperature gauges are operative and indicating the work position, before commencing work.

5.1.3 Make sure that the area behind the machine is clear, before reversing.

5.1.4 Face or look in the direction the machine is travelling.

5.1.5 Watch for workers in the vicinity of the machine, before setting it in motion.

5.1.6 Travel with blade or bucket close to the ground when going up a steep grade.

5.1.7 On all machines, set brakes when parked and block the wheel when parked on grades.

5.1.8 Circle the machine before mounting it to make certain that no one is in the danger area.

5.1.9 Observe following risk control measures while using mobile machinery at construction site:

- a) Plan routes and protect on-site hazards like overhead wires/excavations etc.
- b) Set appropriate speed limits, display and enforce the limits set.
- c) Provision of appropriate lightening in working area.
- d) Provide segregated pedestrian walkways.

- e) Provision and use of high visibility clothing.
- f) Use of beacons/reverse alarms/convex mirrors and reversing cameras. In hazard prone area, manual assistance should be provided for reverse movable equipment to give directions.
- g) All the barricades shall be kept illuminated and all lights shall be kept on from sunset to sunrise.

5.1.10 Daily inspection of moving machinery for proper braking system and indicators.

5.1.11 The working area should be marked or fenced or displayed with sign board to restrict the movement in that area.

5.1.12 New visitor to the area should be advised to the safety aspects before entry and accompanied by a guide wherever required.

5.1.13 Display the emergency contact number.

5.2 Dont's

5.2.1 Get under the machine unless the engine is turned-off and the parking brake is set.

5.2.2 Get on or off a moving machine.

5.2.3 Operate the machine after dusk, unless adequate lighting is provided.

5.2.4 Make sudden stops with raised and/or loaded bucket.

5.2.5 Short circuit the fuse links with wire. Do it with proper fuses.

5.2.6 Break any of the interlocks provided unless required under emergency conditions.

5.2.7 Operate the gates at the openings where excessive vibrations are noticed.

6 FIRST-AID FACILITIES

6.1 Many minor injuries can be treated satisfactorily if first-aid facilities are maintained. Some members of the staff should be trained to provide this treatment and each employee should know how to secure it when required.

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This Indian Standard has been developed from Doc No.: WRD 21 (0589).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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